west virginia department of environmental protection

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BACKGROUND INFORMATION

Application No.:	13-3347
Plant ID No.:	095-00074
Applicant:	Antero Midstream, LLC
Facility Name:	Middlebourne III
Location:	Wick, Tyler County
NAICS Code:	221210
Application Type:	Construction
Received Date:	October 25, 2016
Engineer Assigned:	Jonathan Carney
Fee Amount:	$4,500
Date Received:	October 27, 2016
Complete Date:	November 18, 2016
Due Date:	February 16, 2017
Applicant Ad Date:	November 2, 2016
Newspaper:	Tyler Star News
UTM's:	Easting: 4363.005 km Northing: 503.135 km Zone:17
Description:	Installation of a new natural gas compressor station

DESCRIPTION OF PROCESS

The following process description was taken from the application 13-3347:

Gas from surrounding pipelines enters the facility through receivers and associated slug catcher. From there, the gas is metered and routed through a scrubber and filter separator. Any produced liquids from the scrubber or separator are sent to the 500 barrel settling tank (T04). Gas from the filter separator is sent to one (1) of twelve (12) 2,500 horsepower (hp) Caterpillar G3608 lean burn compressor engines (C-100 through C-1200). The twelve (12) compressor engines are controlled with oxidation catalysts (1C through 12C). Fuel gas for the compressor engines will be treated prior to the engines by a fuel conditioning skid with a 0.5 MMBtu/hr heater (FUEL1) to allow more complete combustion. Produced fluids are routed to the settling tank and gas goes to one of the three (3) TEG dehydrators.

Each TEG dehydrator (DEHY1 through DEHY3) contains a flash gas tank and 1.5 MMBtu/hr reboiler. Each dehydrator has a design rate of 150 million standard cubic feet per day (MMscf/day). Within the dehydrator unit, vent gas from the flash gas tank (DFLSH1 through DFLSH3) is routed to the reboiler (DREB1 through DREB3) and used as fuel. In the case where the flash tank gas cannot be used by the reboiler due to the excess gas or the reboiler being offline, the gas will be sent to the vapor revovery units (VRU-100 and VRU-200) via the storage tanks (T01 through T07) and thus controlled by 98%. Emissions from each reboiler are routed to the atmosphere. The dehydrator still vents are controlled by a flare with at least 98% control efficiency (FLARE1). Produced fluids from the dehydrators (DEHY1 through DEHY3) are routed to the settling tank (T04). The dry gas from the dehydration process is either routed to a fuel gas scrubber, metered, and routed to the compressors as fuel gas or metered and sent to plant discharge.

All produced fluids enter one (1) 500 barrel settling tank (T04) where the fluids settle out as either condensate or produced water. The produced water goes to three (3) 400 barrel produced water tanks (T05 through T07) and the condensate goes to three (3) 400 barrel condensate tanks (T01 through T03). Flashing only occurs at the settling tank as the fluids stabilize in the settling tank before going to the other storage tanks. All seven (7) tanks are connected to a vapor recovery unit (VRU-100) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. A second vapor recovery unit (VRU-200) is also connected to the tanks as a backup unit. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The anticipated production is 300 barrels per day of condensate and 90 barrels per day of produced water.

One (1) natural gas microturbine generator rated as 800 kWe supplies power to the facility (GEN1). The 800 kWe generator is actually comprised of four smaller units, each rated at 200 kWe. There are also small storage tanks (1,000 to 4,000 gallons) located at the facility.

Fugitive emissions from component leaks and emissions from pigging venting or blowdown events also occur.

SITE INSPECTION

The following site inspection was performed by Inspector Douglas Hammell:

> *There was extensive site work underway, still working on access road and leveling off the hill top.*
>
> *No permitted equipment had been delivered, no enforcement issues.*
>
> *The site is acceptable for permit R13-3347, with closest house ~780 to the South West per GE (this house was not visible from hilltop at this time)*

Directions: From Wick, WV, at the intersection of Hog Run Road/CR-6 and Wick Road, head east on Wick Road for 0.85 miles and turn left into the facility entrance.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions associated with this facility consist of the equipment listed in the following table and fugitive emissions. The following table indicates which methodology was used in the emissions determination:

Emission Unit ID#	Process Equipment	Calculation Methodology
C-100	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98

Emission Unit ID#	Process Equipment	Calculation Methodology
C-200	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-300	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-400	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-500	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-600	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-700	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-800	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-900	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-1000	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-1100	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
C-1200	2,500 bhp Caterpillar G3608 4SLB Reciprocating Internal Combustion Engine (RICE) w/Oxidation Catalyst	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
GEN1	800 kWe (output) Capstone C800 Standard Microturbine	Mfg. Data, EPA AP-42 Emission Factors, 40CFR Part 98
DEHY1	150 MMscfd Glycol (TEG) Dehydration Unit	GRI-GlyCalc 4.0
DFLSH1	150 MMscfd Dehydrator Still Vent	GRI-GlyCalc 4.0
DREB1	1.5 MMBtu/hr Dehydrator Reboiler	AP-42, 40 CFR Part 98
DEHY2	150 MMscfd Glycol (TEG) Dehydration Unit	GRI-GlyCalc 4.0

Emission Unit ID#	Process Equipment	Calculation Methodology
DFLSH2	150 MMscfd Dehydrator Still Vent	GRI-GlyCalc 4.0
DREB2	1.5 MMBtu/hr Dehydrator Reboiler	AP-42, 40 CFR Part 98
DEHY3	150 MMscfd Glycol (TEG) Dehydration Unit	GRI-GlyCalc 4.0
DFLSH3	150 MMscfd Dehydrator Still Vent	GRI-GlyCalc 4.0
DREB3	1.5 MMBtu/hr Dehydrator Reboiler	AP-42, 40 CFR Part 98
T01	400 bbl Condensate Tank	ProMax Simulation
T02	400 bbl Condensate Tank	ProMax Simulation
T03	400 bbl Condensate Tank	ProMax Simulation
T04	500 bbl Settling Tank	ProMax Simulation
T05	400 bbl Produced Water Tank	ProMax Simulation
T06	400 bbl Produced Water Tank	ProMax Simulation
T07	400 bbl Produced Water Tank	ProMax Simulation
FUEL1	0.5 MMBtu/hr Fuel Conditioning Heater	AP-42, 40 CFR Part 98
FLARE1	4.8 MMBtu/hr Flare Control Device	AP-42, 40 CFR Part 98
FLARE1(pilot)	0.02 MMBtu/hr Flare Pilot	AP-42, 40 CFR Part 98
VRU-100	Vapor Recovery Unit #1	Mass Balance
VRU-200	Vapor Recovery Unit #2	Mass Balance
LDOUT1	390 bbl/day Production Liquids Truck Loadout	AP-42, ProMax Simulation
	Compressor Blowdowns	Engineering Estimate
	Engine Starter Vents	Engineering Estimate
	Pigging Operations	Engineering Estimate

The following table indicates the control device efficiencies that are required for this facility:

Emission Unit	Pollutant	Control Device	Control Efficiency
Twelve 2,500 hp Caterpillar G3608 4SLB RICE (C-100 – C-1200)	Carbon Monoxide	Oxidation Catalyst	94%
	Volatile Organic Compounds		34%
	Formaldehyde		88%
Three 150 MMscfd TEG Dehydrator Still Vent (DEHY1 – DEHY3)	Volatile Organic Compounds	Flare	98%
	Hazardous Air Pollutantas		98%
Three Condensate Tanks (T01-T03), One Settling Tank (T04), Three Produced Water Tanks (T05-T07)	Volatile Organic Compounds	VRU w/ Backup VRU	98%
	Hazardous Air Pollutants		98%

The total facility PTE (excluding fugitives) for the Station is shown in the following table:

Pollutant	R13-3347 PTE (tons/year)
Nitrogen Oxides	91.91
Carbon Monoxide	58.99
Volatile Organic Compounds	211.16
Particulate Matter-10/2.5	9.39
Sulfur Dioxide	0.66
Formaldehyde	5.82
Total HAPs	21.51
Carbon Dioxide Equivalent	158,287

Maximum detailed controlled point source emissions were calculated by Antero Midstream, LLC and checked for accuracy by the writer and are summarized in the tables on the next pages. The compressor blowdowns, compressor startups, plant shut downs, and pigging operations are based on scheduled events and therefore the estimated emissions from such events are included in the facility's PTE. Limits have been placed in the permit that limit the the number of compressor blowdowns, compressor startups, plant shut downs, and pigging operations.

Emission Unit ID	Emission Point ID	Emission Unit Description	NO_x		CO		VOC		SO_2		PM_{10}	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
C-100	1E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-200	2E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-300	3E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-400	4E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-500	5E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-600	6E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-700	7E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-800	8E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-900	9E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-1000	10E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75

			NO_x		CO		VOC		SO_2		PM_{10}	
Emission Unit ID	Emission Point ID	Emission Unit Description	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
C-1100	11E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
C-1200	12E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	1.65	7.24	0.87	3.80	1.49	6.53	0.01	0.04	0.17	0.75
GEN1	13E	Capstone C800 800kW Microturbine Generator	0.32	1.40	0.88	3.85	0.08	0.35	0.03	0.12	0.05	0.24
DEHY1	14E	Dehydrator Still Vent #1	-	-	-	-	1.46	6.41	-	-	-	-
DFLSH1	15E	Dehydrator Flash Tank #1	-	-	-	-	1.13	4.93	-	-	-	-
DREB1	16E	Dehydrator Reboiler #1	0.15	0.64	0.12	0.54	0.01	0.04	0.00	0.00	0.01	0.05
DEHY2	17E	Dehydrator Still Vent #2	-	-	-	-	1.46	6.41	-	-	-	-

			NO_x		CO		VOC		SO_2		PM_{10}	
Emission Unit ID	Emission Point ID	Emission Unit Description	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
DFLSH2	18E	Dehydrator Flash Tank #2	-	-	-	-	1.13	4.93	-	-	-	-
DREB2	19E	Dehydrator Reboiler #2	0.15	0.64	0.12	0.54	0.01	0.04	0.00	0.00	0.01	0.05
DEHY3	20E	Dehydrator Still Vent #3	-	-	-	-	1.46	6.41	-	-	-	-
DFLSH3	21E	Dehydrator Flash Tank #3	-	-	-	-	1.13	4.93	-	-	-	-
DREB3	22E	Dehydrator Reboiler #3	0.15	0.64	0.12	0.54	0.01	0.04	0.00	0.00	0.01	0.05
T01	23E	Condensate Tank #1	-	-	-	-	0.03	0.14	-	-	-	-
T02	24E	Condensate Tank #2	-	-	-	-	0.03	0.14	-	-	-	-
T03	25E	Condensate Tank #3	-	-	-	-	0.03	0.14	-	-	-	-
T04	26E	Settling Tank	-	-	-	-	6.34	27.77	-	-	-	-
T05	27E	Produced Water Tank #1	-	-	-	-	1.55E-06	0.00	-	-	-	-

			NO_x		CO		VOC		SO_2		PM_{10}	
Emission Unit ID	Emission Point ID	Emission Unit Description	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
T06	28E	Produced Water Tank #2	-	-	-	-	1.55E-06	0.00	-	-	-	-
T07	29E	Produced Water Tank #3	-	-	-	-	1.55E-06	0.00	-	-	-	-
FUEL1	30E	Fuel Conditioning Heater	0.05	0.21	0.04	0.18	0.00	0.01	0.00	0.00	0.00	0.02
FLARE1	31E	Flare Combustion Device	0.33	1.43	1.78	7.78	0.34	1.48	-	-	-	-
FLARE1(pilot)	31E	Flare (pilot)	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
VRU-100 with VRU-200 back-up		Vapor Recovery Unit #1 and #2 back-up (98% capture efficiency)	-	-	-	-	6.31	27.64	-	-	-	-
LDOUT1	32E	Production Liquids Truck Loadout	-	-	-	-	72.12	15.19	-	-	-	-
VENTING OPERATIONS		Compressor Blowdowns/Compressor Startup/Plant Shut Downs/Pigging Operations	-	-	-	-	-	25.80				
Total			20.98	91.91	13.47	58.99	109.87	211.16	0.15	0.66	2.14	9.39

Emission Unit ID	Emission Point ID	Emission Unit Description	Formal-dehyde		HAPs		GHG (CO_2e)	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
C-100	1E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-200	2E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-300	3E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-400	4E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-500	5E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-600	6E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71

			Formal-dehyde		HAPs		GHG (CO_2e)	
Emission Unit ID	Emission Point ID	Emission Unit Description	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
C-700	7E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-800	8E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-900	9E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-1000	10E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-1100	11E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71
C-1200	12E	Caterpillar G3608 SIIC Lean Burn 4 Stroke Compressor Engine	0.11	0.46	0.32	1.38	2811.12	12312.71

Emission Unit ID	Emission Point ID	Emission Unit Description	Formal-dehyde lb/hr	Formal-dehyde tpy	HAPs lb/hr	HAPs tpy	GHG (CO_2e) lb/hr	GHG (CO_2e) tpy
GEN1	13E	Capstone C800 800kW Microturbine Generator	0.01	0.03	0.01	0.06	1064.02	4660.41
DEHY1	14E	Dehydrator Still Vent #1	-	-	0.12	0.51	9.01	40.48
DFLSH1	15E	Dehydrator Flash Tank #1	-	-	0.03	0.12	59.26	259.5
DREB1	16E	Dehydrator Reboiler #1	0.00	0.00	0.00	0.01	155.84	682.59
DEHY2	17E	Dehydrator Still Vent #2	-	-	0.12	0.51	9.24	40.48
DFLSH2	18E	Dehydrator Flash Tank #2	-	-	0.03	0.12	59.26	259.5
DREB2	19E	Dehydrator Reboiler #2	0.00	0.00	0.00	0.01	155.84	682.59
DEHY3	20E	Dehydrator Still Vent #3	-	-	0.09	0.39	9.24	40.48
DFLSH3	21E	Dehydrator Flash Tank #3	-	-	0.03	0.12	59.26	259.5
DREB3	22E	Dehydrator Reboiler #3	0.00	0.00	0.00	0.01	155.84	682.59
T01	23E	Condensate Tank #1	-	-	0.00	0.00	0.00	0.33
T02	24E	Condensate Tank #2	-	-	0.00	0.00	0.00	0.33
T03	25E	Condensate Tank #3	-	-	0.00	0.00	0.00	0.33

Emission Unit ID	Emission Point ID	Emission Unit Description	Formal-dehyde lb/hr	tpy	HAPs lb/hr	tpy	GHG (CO_2e) lb/hr	tpy
T04	26E	Settling Tank	-	-	0.18	0.79	0.26	114.00
T05	27E	Produced Water Tank #1	-	-	0.00	0.00	0.00	0.00
T06	28E	Produced Water Tank #2	-	-	0.00	0.00	0.00	0.00
T07	29E	Produced Water Tank #3	-	-	0.00	0.00	0.00	0.00
FUEL1	30E	Fuel Conditioning Heater	0.00	0.00	0.00	0.00	51.95	227.53
FLARE1	31E	Flare Combustion Device	-	-	0.12	0.52	562.07	2461.87
FLARE1 (pilot)	31E	Flare (pilot)	0.00	0.00	0.00	0.00	2.12	9.27
VRU-100 with VRU-200 back-up		Vapor Recovery Unit #1 and #2 back-up (98% capture efficiency)	-	-	1.79E-01	7.86E-01	2.57E-01	1.13E+02
LDOUT1	32E	Production Liquids Truck Loadout	-	-	2.02	0.42		
VENTING OPERATIONS		Compressor Blowdown/ Compressor Startup/Plant Shutdown/ Pigging Operations				0.52		2,035
Total			1.28	5.59	6.72	21.51	36086.94	160,322.05

REGULATORY APPLICABILITY

45CSR2 - *To Prevent and Control Particulate Air Pollution From Combustion of Fuel in Indirect Heat Exchangers*

The purpose of 45CSR2 is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units. 45CSR2 states that any fuel burning unit that has a heat input under ten (10) million Btu's per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The Glycol Dehydrator Reboilers (DREB1-DREB3) and fuel conditioning heater (FUEL) at this facility meet the definition for fuel burning units (section 2.10). The fuel burning units have heat input ratings that are less than 10 MMBtu and are exempt from the aforementioned sections of 45CSR2.

The reboilers and fuel heater will have to meet a 10 percent opacity limit. Visible emission monitoring will be required.

45CSR4 - *To Prevent and Control the Discharge of Air Pollutants Into the Open Air Which Causes or Contributes to an Objectionable Odor or Odors*

The facility is subject to the requirements of 45CSR4 and shall not allow the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.

45CSR6 - *Control of Air Pollution From Combustion of Refuge*

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

From section 2.7 this facilities ground level flare (F1) meets the definition of an incinerator and is therefore subject to applicable Rule 6 requirements. From section 4.1 the maximum allowable total particulate matter emission rate is 0.46 lb/hr. The flare is a smokeless design. The flare has a potential to emit particulate matter of <0.01 lb/hr and does not exceed the threshold. The opacity limit for the emergency flare is 20%.

45CSR13 - *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation*

The facility is subject to 45CSR13 because this source has the potential to emit at least 6 lb/hr and 10 tons/year of NO_x, CO, and VOC (any uncontrolled regulated air pollutant), and the potential to emit two (2) pounds per hour or five (5) tons per year of hazardous air pollutants, and is subject to a substantive requirement of an emission control rule promulgated by the Secretary (45 CSR 6, 40 CFR 60 JJJJ, and OOOOa, 40 CFR 63 Subpart HH)

Antero Midstream, LLC paid the appropriate fee of $4,500.00 and published the required legal advertisement for a construction permit application.

45CSR16 - *Standards of Performance for New Stationary Sources Pursuant to 40CFR60*

45CSR16 incorporates by reference the standards of performance for new stationary sources (40CFR60). Middlebourne III Station is subject to 40CFR60 Subpart JJJJ, and OOOOa, and is therefore subject to 45CSR16.

45CSR22 - *Air Quality Management Fee Program*

The facility is subject to the requirements of 45CSR22 and shall pay fees according to the application fee schedule. The proper application fee ($1,000 for construction application fee, $1,000 for additional NSPS fee, and $2,500 for additional NESHAP fee) $4,500 was received on October 27, 2016.

45CSR30 - *Requirements for Operating Permits*

Antero Midstream's Middlebourne Station exceeds the 100 ton/yr threshold for VOC and is therefore subject to 45CSR30 as a major source. The Middlebourne III Compressor Station will need to apply for a permit under this rule within 12 months after commencing operation per Section 4.1.a.2 of the rule. Middlebourne Station will be required to keep their Certificate to Operate current.

45CSR34 – *Emission Standards for Hazardous Air Pollutants*

45CSR34 incorporates by reference the standards for hazardous air pollutants (40CFR63). Middlebourne III Station is subject to 40CFR63 Subpart HH and is therefore subject to 45CSR34.

40CFR60 Subpart JJJJ - *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*

40CFR60 Subpart JJJJ sets forth emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject spark ignition internal combustion engine. This subpart applies to the twelve (12) compressor engines, C-100 through C-1200, because they will be manufactured on or after July 1, 2007. Engines C-100 through C-1200 will have to meet the following emission standards: NOx 1.0 g/hp-hr, CO 2.0 g/hp-hr, and VOC 0.7 g/hp-hr. These emissions standard will have to be met over the entire life of each engine. The non-certified engines (C-100 through C-1200) will have to undergo initial performance testing and be tested every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance with the emission standards of 40CFR60 Subpart JJJJ.

40CFR60 Subpart OOOOa – *Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification, or Reconstruction Commenced after September 18, 2015*

EPA published its New Source Performance Standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. EPA published amendments to the Subpart on September 23, 2013 and June 3, 2016. 40CFR60 Subpart OOOOa establishes emission standards and compliance schedules for the control of the pollutant greenhouse gases (GHG). The greenhouse gas standard in this subpart is in the form of a limitation on emissions of methane from affected facilities in the crude oil and natural gas source category that commence construction, modification or reconstruction after September 18, 2015. This subpart also establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO_2) emissions from affected facilities that commence construction, modification or reconstruction after September 18, 2015. The effective date of this rule is August 2, 2016.

The Station is not a gas well pad but is a natural gas processing plant. Any pneumatic controllers installed at the Station will operate at a natural gas bleed rate less than 6 standard cubic feet per hour. The storage tanks at the Station have VOC emissions less than 6 tons per year via voluntary controls that consist of a VRU and a back-up VRU. Therefore, they are not subject to Subpart OOOOa.

Antero Midstream, LLC will comply with applicable requirements for reciprocating compressors under Subpart OOOOa. This includes replacement of the reciprocating compressor rod packing at least every 26,000 hours of operation or 36 months or installation of a rod packing emissions collection system.

Antero Midstream, LLC will develop a fugitive emission monitoring plan and perform fugitive component monitoring as required by this rule. Antero Midstream, LLC will be required to conduct quarterly Leak Detection and Repair (LDAR) monitoring. Antero Midstream, LLC will have one year to conduct an initial leaks monitoring survey.

40CFR63 Subpart HH – *National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities.*

Subpart HH applies to owners and operators of each triethylene glycol (TEG) dehydration unit that are located at oil and natural gas production facilities.

The Middlebourne III facility is exempt from the requirements of this subpart in accordance with 40 CFR 63.764 (e)(ii) in which the facility is exempt if the actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram (1 ton) per year as determined by the procedures specified in §63.772(b)(2)(GRI-GlyCalc).

The results from GRI-GlyCalc provided in the application indicate that each of the TEG Dehydration units at the Middlebourne III facility will not exceed the exemption threshold of 0.90 megagram(1 ton) of benzene emissions per year. Therefore the facility is exempt from the requirements of 40 CFR 63 Subpart HH except that the records of the determination of these criteria must be maintained as required in §63.774(d)(1).

40CFR63 Subpart ZZZZ – *National Emission Standards for Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines (RICE).*

Subpart ZZZZ applies to stationary RICE at a major or area source of HAP emissions. Subpart ZZZZ applies to the Middlebourne III Compressor Station as the compressor engines will be new RICE. The engines will comply with Subpart ZZZZ by complying with 40 CFR Part 60, Subpart JJJJ in accordance with 40 CFR 63.6590(c).

The following rules do not apply to the facility:

45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants)

45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment)

The Station is located in Tyler County, which is an unclassified county for all criteria pollutants, therefore the Station is not applicable to 45CSR19.

As shown in the following table, Antero Midstream is not a major source subject to 45CSR14 or 45CSR19 review. According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, the fugitive emissions are not included in the PTE below.

Pollutant	**PSD (45CSR14) Threshold (tpy)**	**NANSR (45CSR19) Threshold (tpy)**	**Station PTE (tpy)**	**45CSR14 or 45CSR19 Review Required?**
Carbon Monoxide	250	NA	58.99	No
Nitrogen Oxides	250	NA	91.91	No
Sulfur Dioxide	250	NA	0.66	No
Particulate Matter 2.5	250	NA	9.39	No
VOC	250	NA	211.16	No

40CFR60 Subpart Kb (Standards of Performance for VOC Liquid Storage Vessels)

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The largest tank that Antero Midstream, LLC has proposed to install are 63.59 cubic meters each. Therefore, Antero Midstream, LLC would not be subject to this rule.

40CFR60 Subpart KKK (Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants)

40CFR60 Subpart KKK applies to onshore natural gas processing plants that commenced construction after January 20, 1984, and on or Before August 23, 2011. The Station is has not yet been constructed, therefore, Antero Midstream, LLC is not subject to this rule.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The Station is classified as an area source of hazardous air pollutants. Listed below is a description of the primary hazardous air pollutants for this facility.

Acetaldehyde
Acetaldehyde is mainly used as an intermediate in the synthesis of other chemicals. It is common in the environment and may be formed in the body from the breakdown of ethanol. Acute (short-term) exposure to acetaldehyde results in effects including irritation of the eyes, skin, and respiratory tract. Symptoms of chronic (long-term) intoxication of acetaldehyde resemble those of alcoholism. Acetaldehyde is considered a probable human carcinogen (Group B2) based on human cancer studies and animal studies that have shown nasal tumors in rats and laryngeal tumors in hamsters.

Acrolein
Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. It is toxic to humans following inhalation, oral or dermal exposures. Acute (short-term) inhalation exposure may result in upper respiratory tract irritation and congestion. No information is available on its reproductive, developmental, or carcinogenic effects in humans, and the existing animal cancer data are considered inadequate to make a determination that acrolein is carcinogenic to humans.

Benzene
Benzene is found in the air from emissions from burning coal and oil, gasoline service stations, and motor vehicle exhaust. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and,

at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. EPA has classified benzene as a Group A, human carcinogen.

Toluene
The acute toxicity of toluene is low. Toluene may cause eye, skin, and respiratory tract irritation. Short-term exposure to high concentrations of toluene (e.g., 600 ppm) may produce fatigue, dizziness, headaches, loss of coordination, nausea, and stupor; 10,000 ppm may cause death from respiratory failure. Ingestion of toluene may cause nausea and vomiting and central nervous system depression. `Contact of liquid toluene with the eyes causes temporary irritation. Toluene is a skin irritant and may cause redness and pain when trapped beneath clothing or shoes; prolonged or repeated contact with toluene may result in dry and cracked skin. Because of its odor and irritant effects, toluene is regarded as having good warning properties. The chronic effects of exposure to toluene are much less severe than those of benzene. No carcinogenic effects were reported in animal studies. Equivocal results were obtained in studies to determine developmental effects in animals. Toluene was not observed to be mutagenic in standard studies.

Ethylbenzene
Ethyl benzene is mainly used in the manufacturing of styrene. Acute (short-term) exposure to ethyl benzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects, such as dizziness. Chronic (long-term) exposure to ethyl benzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethyl benzene. Limited information is available on the carcinogenic effects of ethyl benzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethyl benzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethyl benzene as a Group D, not classifiable as to human carcinogenicity.

Xylenes
Commercial or mixed xylene usually contains about 40-65% m-xylene and up to 20% each of o-xylene and p-xylene and ethyl benzene. Xylenes are released into the atmosphere as fugitive emissions from industrial sources, from auto exhaust, and through volatilization from their use as solvents. Acute (short-term) inhalation exposure to mixed xylenes in humans results in irritation of the eyes, nose, and throat, gastrointestinal effects, eye irritation, and neurological effects. Chronic (long-term) inhalation exposure of humans to mixed xylenes results primarily in central nervous system (CNS) effects, such as headache, dizziness, fatigue, tremors, and incoordination; respiratory, cardiovascular, and kidney effects have also been reported. EPA has classified mixed xylenes as a Group D, not classifiable as to human carcinogenicity. Mixed xylenes are used in the production of ethylbenzene, as solvents in products such as paints and coatings, and are blended into gasoline.

Formaldehyde
Formaldehyde is used mainly to produce resins used in particle board products and as an intermediate in the synthesis of other chemicals. Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Acute (short-term) and chronic (long-term) inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. EPA considers formaldehyde a probable human carcinogen (Group B1).

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at *www.epa.gov/iris*.

AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) or 45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) as seen in the table listed in the Regulatory Discussion section under 45CSR14/45CSR19.

SOURCE AGGREGATION

"Building, structure, facility, or installation" is defined as all the pollutant emitting activities which belong to the same industrial grouping, are located on one or more contiguous and adjacent properties, and are under the control of the same person.

The Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term "adjacent" and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

The Station will operate under SIC code 4923 (Natural Gas Distribution). There is another compressor station (Mountain Compressor Station) 4.4 miles south of the Middlebourne facility operated by Antero Midstream under the same SIC code. The land between these two facilities is not owned or managed by Antero Midstream LLC and therefore these two facilities are not contiguous or adjacent.

"Contiguous or Adjacent" determinations are made on a case by case basis. There are no other equipment and activities in the oil and gas sector that are under common control of Antero Midstream LLC that are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Because the Station is not located on contiguous or adjacent properties with other facilities under common control, the emissions from this facility shall not be aggregated with other facilities for the purposes of making Title V and PSD determinations.

MONITORING OF OPERATIONS

Antero Midstream, LLC will be required to perform the following monitoring and recordkeeping:

- Monitor and record quantity of natural gas consumed for all engines and combustion sources.
- Monitor and record quantity of tank and truck loading throughputs.
- Monitor and record all compressor blowdowns/startups, pigging operations, and plant shutdowns.
- Monitor all applicable requirements of 40CFR60 Subparts JJJJ and OOOOa.
- Monitor the presence of the flare pilot flame with a thermocouple or equivalent.
- Maintain records of testing conducted in accordance with the permit. Said records shall be maintained on-site or in a readily accessible off-site location
- Maintain the corresponding records specified by the on-going monitoring requirements of and testing requirements of the permit.
- Maintain records of the visible emission opacity tests conducted per the permit.
- Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility. These records shall include the natural gas compressor engines and ancillary equipment.
- Maintain records of all applicable requirements of 40CFR60 Subparts JJJJ and OOOOa and 40CFR63 Subpart HH.
- Maintain records of the flare design evaluation.
- The records shall be maintained on site or in a readily available off-site location maintained by Antero Midstream, LLC for a period of five (5) years.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that the Antero Midstream, LLC-Middlebourne III natural gas compressor station should meet all the requirements of applicable rules and regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Tyler County location should be granted a 45CSR13 construction permit for their facility.

Jonathan Carney
Jonathan Carney
Permit Writer

3/26/2017
DATE